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Refuge Update – May/June 2006, Volume 3, Number 3

U.S Fish & Wildlife Service
National Wildlife Refuge System

RefugeUpdate

May/ June 2006 Vol 3, No 3

Inside

On the Lookout for Pathogenic Bird Flu

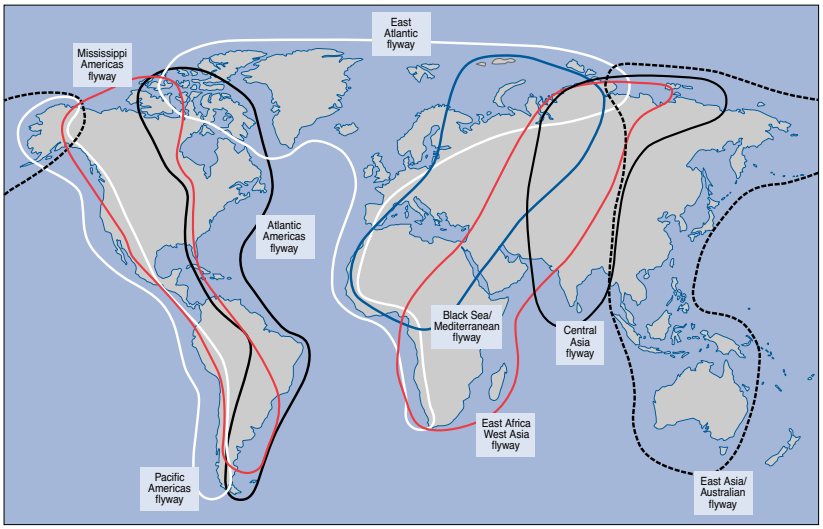
The role wild migrating birds might play in the movement and distribution of the virus to North America is unknown. (USFWS)

Experts within the Fish and Wildlife Service, US Geological Survey and the Alaska Department of Fish and Game, along with USDA and Native Alaskan organizations, are working together to detect when or if the highly pathogenic avian influenza (HPAI) H5N1 virus, also known as "bird flu," appears in North America.

There are many subtypes of avian influenza. The specific one of concern - highly pathogenic H5N1 that has been found in more than 30 countries - is the focus of North American migratory bird surveillance. It is very likely that low pathogenic viruses, including those of the H5N1 subtype, will be found during this surveillance. These low pathogenic types are not significant for migratory birds and humans, and are only distantly related to the specific HPAI H5N1 of concern.

The role wild migrating birds might play in the movement and distribution of the virus to North America is unknown. Some believe that migratory birds from Asia, breeding in Alaska or mixing with North American birds in Siberian breeding grounds, could move the virus to North

Map of bird migratory routes.



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From the Director

Conservation with our Neighbors

Some of our most visible achievements—and contentious debates—have revolved around the Endangered Species Act. Its impact is seen firsthand not only on the 56 national wildlife refuges specifically created for endangered species but on the hundreds of others that contain habitat critical to numerous listed species. Much of the conflict is unnecessary. We need to be preventing our nation's plant and animal species from declining to the point where they are listed under the ESA. Our first points of contact often are landowners who want to work with us.

Kerry Russell owns about 130 acres adjacent to the Balcones Canyonlands National Wildlife Refuge in Texas, where birdwatchers find some of the state's best habitat for two endangered songbirds – the black-capped vireo and the golden-cheeked warbler. Less than an hour's drive from Austin, the refuge gives visitors a chance to experience the wilds of the Texas Hill Country.

Russell appreciated the value of his land. In 2002, he enrolled 20 acres under a Safe Harbor Agreement. Such agreements are designed to promote voluntary management for listed species on non-federal property while assuring landowners we won't impose other restrictions on use of that land in the future. It means that Kerry Russell's land is now as welcoming to the endangered songbirds as is the national wildlife refuge just across the road.

When the agreement ends, Russell can return his property to its baseline condition when the acreage was enrolled. If habitat improvements attract black-capped vireos — once plentiful from Mexico to Kansas but today limited to just three counties in Oklahoma and Texas — then the presence of the birds will not restrict the family's use of the acreage beyond the agreed upon voluntary conservation actions.

People are part of the land. Aldo Leopold understood that when he said, "All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts." Many private landowners have a deep concern for the land and are willing to work hard to accommodate the wild plant and animal communities living there. We need to give them the tools to do just that.

Our Refuge System has long encouraged private involvement. Working closely with the Department of Agriculture's Conservation Reserve Program, for example, wildlife refuges give technical assistance to help landowners restore wetlands. Today, more than 240 California

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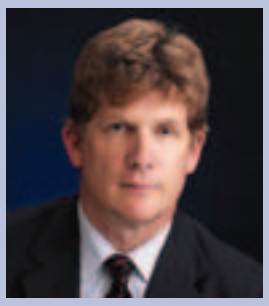

Chief's Corner

In A Spirit of Cooperation for "One Service"

Director Dale Hall recently gave me the tremendous opportunity to serve as the Acting Chief of Refuges. I left Washington, DC, in 1994, having served seven years in the nation's capital, half as Chief of Realty. So, in many ways, this has been like coming home!

I have worked with many of you on wonderful projects throughout my career. I started my public service by acquiring habitat at Hart Mountain Refuge in Oregon and easements for the Central Valley Refuges of California. In later years, I had one of my most rewarding jobs as Assistant Regional Director, Refuges and Wildlife, in the Southeast. Of course, as Deputy Regional Director in the Southwest, I have worked on some great refuge projects, including one that makes me extremely proud – establishment of Caddo Lake Refuge in Texas.

I can't adequately describe how privileged I feel to take the helm of a group that leaves such an indelible mark on America's heritage. The world's smartest, hardest-working people work for the Service and our Refuge System. They are extraordinarily capable and dedicated. Our work for America's wildlife is second to none. Our partnership

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*Refuge*Update

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Crime Threatens People and Habitat at Buenos Aires Refuge

The lush Buenos Aires National Wildlife Refuge offers 118,000 acres of habitat for threatened and endangered plants and animals – and shares 5.5 miles of border with Mexico. It is itself threatened by robbery, death and illegal immigrant crossings.

The 2005 Uniform Crime Report for the Arizona refuge records five homicides, nine deaths from exposure or dehydration, 39 armed robberies, 35 auto thefts, 40,000 pounds of marijuana seized on or next to the refuge, and 15,800 illegal immigrant apprehensions. In the first few months of 2006, four refuge vehicles have been stolen and there have been six burglaries of refuge living quarters.

Illegal immigration and drug smuggling across the refuge's international border have dramatically increased over the past 10 years, according to Buenos Aires Refuge Project Leader Mitch Ellis. Ellis estimates that about 250,000 people illegally entering the U.S. cross the refuge each year; the refuge receives about 30,000 legal visitors annually.

As the U.S. Border Patrol tightened security near more traditional ports of entry like San Diego and El Paso, traffic has moved to remote areas like the refuge and such border towns as Sasabe.

"From January to May, the refuge may have as many as 3,000 illegal immigrants walking the refuge each night," says Ellis. "Many have paid huge sums of money to smugglers and are risking their lives so they don't care much if they set fires, destroy habitat, leave human waste, cut fences. Can you blame them? Their minds are on other things, like avoiding law enforcement, staying alive and making it north."

The result is incredible resource damage on the refuge: more than 1,300 miles of illegal trails, and 50-100 head of cattle moving into the refuge each day through cut fences. Refuge volunteers and staff spent more than 3,000 hours picking up trash in 2005, while fully 30-40 percent of the refuge manager's time is devoted to border issues and interagency coordination.

Monitoring by Law Enforcement

The refuge is responding on many fronts. New standard operating procedures are in effect for fieldwork. Student Conservation Association workers hired each year to do endangered species monitoring, for example, must now meet each morning with a law enforcement officer so they can be escorted to the area they will survey.

Law enforcement schedules have been revised to accommodate employee safety concerns. Certain areas of the refuge are off-limits entirely. In certain units at night or twilight, all fieldwork – such as pygmy owl surveys – must be monitored by a law enforcement officer. This means checking in and out with a law enforcement officer before going into or leaving the field, and, as the memo says, "You must speak directly to the officer – no messages."

There is also a special safety flyer distributed at all offices and trailheads. Among its points: "Most illegal immigrants are unprepared for the rigors of crossing the Sonoran Desert…and are unaware they are crossing a national wildlife refuge dedicated to conservation for wildlife…Nearby water sources are often so fouled by pollution that wildlife can no longer use them…Some illegal visitors are armed dangerous and determined to complete the trip at any cost."

The flyer warns hikers to avoid traveling on unofficial trails, use good judgment in providing water to people in distress, and report any suspicious activity to refuge staff or U.S. Border Patrol.

There are 10 to 100 Border Patrol officers on the refuge at any one time, depending on the season. They have moved from being a peripheral partner to the primary partner on the refuge, says Ellis. "I am spending more and more time as a manager coordinating with the Border Patrol to share information, schedule special operations and accommodate their needs."

In 2005, 15,800 illegal immigrants were apprehended crossing from Mexico into the United States through Buenos Aires National Wildlife Refuge. The refuge has four law enforcement officers, up from one five years ago, and is asking for more. (USFWS)

Five years ago, the refuge had one full-time law enforcement officer. Now there are four with requests pending for at least two more. Ellis says it would take a law enforcement staff of six or seven officers just to address security and safety issues, not to mention resource damage or prevention. "We are in a reaction mode/crisis response situation currently," adds Ellis.

Certain areas of nearby Organ Pipe Cactus National Monument have been closed to the public for security reasons, and Ellis says it is possible the same decision may have to be made about portions of Buenos Aires Refuge. He adds, "We'd be much better off if our legitimate visitors weren't being distracted by the illegal border activity and could stay focused on the wildlife." ◆

Saving Avian Cousins in Japan

Ten Laysan albatross chicks flown a thousand miles by chartered plane from Midway Atoll National Wildlife Refuge to Kauai, Hawaii, were declared healthy, freed from quarantine and released into the wild of the Kilauea Point National Wildlife Refuge in early March. An increased chance of survival for the chicks' cousins half a world away in Japan is riding on the project in Hawaii.

Two Japanese ornithologists are working with refuge staff to raise the Laysan chicks, hoping what they learn about nurturing the wild birds on Kilauea Point Refuge will help them bring Japan's own endangered short-tailed albatross, known as the golden gooney, back from the brink of extinction.

Kilauea Point Refuge is a particularly useful laboratory for the Japanese researchers because of the U.S. Fish and Wildlife Service's success at supporting the Laysan albatross colony there.

Paleontologists believe the Laysan albatross was once plentiful throughout the Hawaiian Islands, but the birds' most flourishing colony is now at Midway Atoll.

A December-January count of Laysan and black-footed albatross at Midway Atoll Refuge found a record number of birds and more than 510,000 nests during a three-week period – the highest numbers since the count began 15 years ago.

To encourage the Laysan albatross population in the main Hawaiian Islands, the Service has been fostering a Laysan colony at Kilauea Point Refuge, even using birdcalls to lure albatross. The most recent count found about 200 breeding birds there. The birds also nest in other locations along Kauai's north shore and in a state natural area reserve on the northeastern corner of Oahu.

Fewer Than 2,000 Today

The golden gooney may once have been the most plentiful of the three North Pacific albatross species. But feather hunters slaughtered millions of the birds around the turn of the last century, resulting in the drastic decline of the species over the next 50 years.

A Developing Case for Blackwater Refuge

Economic development versus environmental protection is an old debate in the United States. It has gained new life in Cambridge, Md.

While Blackwater National Wildlife Refuge on Maryland's Eastern Shore is caught up in just such a contentious discussion, refuge staff is working to make it a win-win for the refuge, the county tax base, and protectors of the Chesapeake Bay, into which Blackwater River empties.

Blackwater Refuge is one of the treasures of the Mid-Atlantic. Its 28,000 acres, part of the nation's biggest estuary, provide habitat for the largest population of nesting bald eagles in the Chesapeake Bay region. Ospreys, peregrine falcons and the endangered Delmarva fox squirrel also call Blackwater home. In all, more than 270 state and federal threatened and endangered species live at the refuge.

But the refuge's crucial wetlands are increasingly threatened by rising water levels. A large new resort development planned a few miles upstream, on the Little Blackwater River, could worsen the situation.

Blackwater Resort

The proposed development would sit on a 1,080-acre farm which nearby Cambridge annexed in 2004. The development plans include 3,200 single- and multi-family homes, a golf course, a 100-room conference center and hotel, and retail shops. About 330 acres of the development would be set aside as protected habitat and conservation areas.

The development is expected to bring about 10,000 new people to the area, nearly doubling the size of Cambridge and pumping as much as $1 billion into the area's tax base. In a part of the Eastern Shore that has been languishing financially for 40 years, local officials eager for tax revenue have taken several key votes to keep the development project on track.

Opposition

The Chesapeake Bay Foundation is spearheading a campaign against the development and encouraging other groups and residents throughout the Chesapeake Bay watershed to urge Maryland's governor to stop the resort development.

Refuge Manager Glenn Carowan has testified at public zoning hearings that the construction project poses serious concerns for the refuge, the Little Blackwater River watershed and, eventually, the Chesapeake Bay.

Carowan notes that between 1938-1989, Blackwater Refuge lost about 8,000 acres of marshland to open water due to sea

The 10 Laysan albatross chicks flown a thousand miles in early March from Midway Atoll National Wildlife Refuge to be released into the wild of the Kilauea National Wildlife may hold a key to the survival of Japan's golden gooney (Phoebastria albatrus), once possibly the most abundant of the three North Pacific albatross species. (Sandy Hall/USFWS)

Fewer than 2,000 golden gooneys are thought to exist today and are known to breed only on remote islands in the western Pacific. Each year, one or two short-tailed albatross visit Midway Atoll Refuge during the nesting season, but so far, none has found a mate.

Torishima Island, where 80 to 85 percent of the golden gooneys breed, is an active volcano; the natural colony site is in a part of the island susceptible to mudslides and erosion. The other breeding site in the Senkaku Islands is threatened by oil exploration and Chinese claims to the territory.

Japanese ornithologists are afraid their native, short-tailed albatross faces extinction unless they successfully transplant the bird to a new, safer breeding colony. Albatrosses generally return to nest where they were reared, so simply moving adult birds to a new location does not work. Instead, the Japanese researchers hope what they learn about handling and rearing the Laysan chicks in Hawaii will jump start Japan's own efforts to speed the recovery of the golden gooney population.

Moving a Thousand Miles

The Laysan albatross chicks were captured by hand by refuge staff on Sand Island, one of three islands of the Midway Atoll Refuge. The young seabirds were placed in individual shipping containers and flown from Midway Atoll Refuge to Lihue Airport on Kauai. The birds were tagged for identification, then underwent routine inspections and health tests required by state and federal law.

After the chicks were released from quarantine, they were trucked to their new cliffside home at Crater Hill, a part of Kilauea Point Refuge, where they will live until they fledge, probably around July or August. The birds are weighed and measured before each feeding to monitor their growth.

"The site is closed to the public to protect and minimize disturbance to wildlife," says Refuge Biologist Brenda Zaun. "It's a beautiful area for albatross, on a protected ridge overlooking the ocean with trade winds needed for their first flight in a few months."

Until then, the two Japanese researchers, Tomohiro Deguchi and graduate research assistant Tomoko Harada of the Yamashina Institute of Ornithology, will feed, care for and collect data about the birds – information the two researchers will take home to Japan, and the golden gooney they hope to save. ◆

The Refuge System and the state of Maryland have spent millions of dollars in the last 10 years to restore the wetlands. A large new resort development planned just miles upstream from Blackwater National Wildlife Refuge could harm those wetlands. (Tim MCCabe/USFWS)

level rise, erosion of shorelines, and overpopulation of such plant-eating animals as native muskrats and invasive nutria, introduced into the marshes in the 1940s. The Refuge System and the state of Maryland have spent millions of dollars in the last 10 years to restore the wetlands – reducing the number of nutria and Canada geese that have destroyed marsh plants and using dredge material to fill open water areas and plant new marsh plants in the resulting wetlands.

Carowan worries that work could be undone if the resort development effectively paves over pervious farmland: a recipe for even more water draining from the 23,000-acre Little Blackwater River watershed directly into the refuge and from there into the bay.

Compromise

In late February, Carowan and other members of the Blackwater Refuge staff – Senior Supervisory Biologist Dixie Birch, Refuge Operations Specialist Rebekah Packett, and Fire Control Officer Bill Giese – were instrumental in convening a meeting of all the interested parties, including the mayor's office and county zoning officials who support the project, as well as the Chesapeake Bay Foundation and local groups who oppose it. Representatives from the University of Maryland's Horn Point Laboratory for Environmental Science, Maryland Fisheries, the Dorchester County Soil Conservation District and Patuxent Research Refuge also sat in. Carowan hopes to establish a fact-based framework

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Pushing Dirt … Safely

There are 4,200 pieces of "heavy iron" in the National Wildlife Refuge System, including bulldozers, backhoes, cranes and forklifts. There are another 2,200 agricultural tractors with assorted implements like plows and mowers. All this equipment has a replacement value of $500 million, not counting the 2,000 all terrain vehicles (ATVs) and 300 snowmobiles.

Beginning in 2004, the Refuge System created positions for a national heavy equipment coordinator and seven regional coordinators as the first step in providing consistent safety training and maximizing the effectiveness of both the heavy equipment and the Wage Grade workforce.

Regional coordinators are all in place now. National Coordinator Steve Flanders says most of the regional coordinators came up through the ranks of the Fish and Wildlife Service, adding that he was a "dirt pusher" himself at Montezuma National Wildlife Refuge in New York when he first recommended a more consistent approach to safety training. The regional coordinators are:

Region 1/CNO – Pat Hickey
Region 2 – Ed Bass
Region 3 – Dale Pittman
Region 4 – Stan Zazado
Region 5 – Charles Glock
Region 6 – Wade Briggs
Region 7 – Thomas Siekaniec

Gone Are the "Bone Yards"

The top priorities are safety training and utilization management. Since 1988, safety training has been required, but policies were implemented with varying degrees of consistency in different regions. Several accidents over the past few years proved the need for a more standard nationwide policy.

People using heavy equipment have a much wider range of ability than in the past and often include college students, volunteers and staff from partner agencies and Service employees. Safety training must be completed before anyone can be authorized to use a piece of heavy equipment. This training includes eight hours of pre-course, classroom and hands-on exercises for each type of equipment.

One of the most important tasks for the new heavy equipment coordinators will be scheduling mandatory safety training for everyone who uses heavy equipment, including staff, volunteers and college students. (Rocky Chesser/USFWS)

A key job of the regional coordinators will be scheduling training sessions. There are 110 trained heavy equipment safety instructors using updated training manuals and a Service-wide National Heavy Equipment Safety Training Program. A refresher course is also being developed. The hands-on and Web-based refresher will be required every three years.

Rent, Buy or Borrow

The regional coordinators will also facilitate efficient and cost-effective acquisitions, rental and maintenance of heavy equipment. As the 2006 Action Plan states, "gone are the days when a project leader can moonlight as an equipment manager and gone are the days when the Service can afford bone yards full of equipment acquired for one project."

Flanders is quick to point out that the number one goal is still to make sure refuges have the equipment when they need it, "but if we're going to spend $150,000 for a motor grader, it has to be run more than 30 hours a year." It will be up to the coordinator to assist refuge staff in getting the right equipment for the right job, which could mean borrowing a particular piece from a nearby refuge or renting it rather than buying it.

"We must strengthen our equipment management practices by implementing an effective preventive maintenance program that makes us proactive, not reactive to maintenance needs," says Flanders. "We spend way too much time and money fixing a machine after it breaks down."

The regional coordinators will also be involved in Wage Grade issues. Each coordinator will serve on regional Wage Grade committees, and a national committee will be established to evaluate standardized position descriptions, Fair Act competition, OSHA compliance and other policies. These committees will be another avenue for sharing information. ◆

Bon Secour: Open At Last

Bon Secour National Wildlife Refuge on the Alabama Gulf Coast officially re-opened to the public April 10 with ceremonies thanking the people who helped the refuge on Mobile Bay recover from the one-two punch of Hurricanes Ivan and Katrina. Those storms battered the refuge's five miles of beach in the back-to-back hurricane seasons of 2004-2005.

Ralph Gilges, president of Friends of Bon Secour Refuge, introduced Congressman Jo Bonner, who represents South Alabama and was instrumental in securing federal money for the refuge cleanup. Congressman Bonner delivered the keynote speech. Baldwin County Commissioner Albert Lipscomb was an honored guest.

Hurricane Ivan came first, making landfall at Bon Secour Refuge in September 2004 with 130 mile-per-hour winds that pushed tons of debris onto the refuge.

Refuge Manager Lloyd Culp says the contractor hired for cleanup after Ivan was making good progress by August 2005. That's when Hurricane Katrina slammed Bon Secour Refuge with high winds and water for the second time in less than a year. "The contractor had to go back and do it all again," says Culp.

More than 14,000 cubic yards of debris from the two storms, enough to fill 576 dump trucks, were removed from the refuge at a cost of just under $4 million. Culp says the level of destruction and complexity of cleanup were unique in his 32 years with the U.S. Fish and Wildlife System.

Culp is proud that 30 percent of the removed debris removed was recycled. Additionally, the contractor was required to clean up as much as possible by hand because of the additional damage that heavy moving equipment could have done to the fragile beach habitat already hard hit by two storms.

Bon Secour Refuge Wildlife Biologist Jereme Phillips says Ivan's and Katrina's combined force leveled the refuge's frontal dunes. The tertiary dunes, standing some 30-feet tall and anchored by such woody plants as sand live oak and seaside rosemary, survived the storms and continue to provide habitat for the endangered Alabama beach mouse and the threatened loggerhead sea turtle.

Beach Habitat Damaged

But the loss of the first two lines of dunes will be a problem "for the foreseeable future," says Phillips, because the leveled beach makes it more likely future storms will wash away the dunes that do remain. Without the buffer of the first two lines of dunes, he says, turtle nests will be much more vulnerable to even small tropical storms.

In addition, says Phillips, "The changed seascape may contribute to hatchling disorientation as the turtles try to find their way to the Gulf of Mexico. Dunes help to block artificial lighting from nearby communities, provide a silhouette that has been demonstrated by research to aid in hatchling sea-finding behavior, and are sometimes selected as nest sites."

Of the 11 turtle nests confirmed on the Ft. Morgan Peninsula in Summer 2005, Hurricane Katrina destroyed nine; two fell victim to other storms. The loss of nesting areas for loggerheads on the Gulf Coast could have an impact on the species as a whole.

Where the Boys Are

While south Florida produces about 90 percent of the loggerhead sea turtles in North America, about 80 percent of the hatchlings are female. But on nesting beaches like those in Alabama, the male-female ratio of hatchlings is about one-to-one, suggesting those "northern" nesting areas, with cooler air and sand temperatures, may play an important role in contributing males to the population.

Staff and volunteers are now busy with dune restoration at Bon Secour, installing sand fences to re-establish dunes and planting sea oats, red and white morning glories, sea purslane and panic grass, among other native plants.

Reflecting on two years of damage and recovery, Phillips says "While we're in this cycle of active hurricane seasons, we are planning for the worst. But we're hoping for relief from the storms so that both the people and the wildlife of coastal Alabama can fully recover." ◆

The level and complexity of cleanup at Bon Secor National Wildlife Refuge was unique in more than 30 years. (USFWS)

Looping through Western Oklahoma

By Emily Neidigh

The 2,000-mile Great Plains Trail of Oklahoma became a reality for western Oklahoma and four National Wildlife Refuges - Washita, Optima, Wichita Mountains and Salt Plains. Fashioned by the same company that helped create the Texas Birding Trails, the Great Plains Trail of Oklahoma picks up where the Texas trails left off, traveling through such little-known communities as Hardesty, Freedom, Cleo Springs and Roosevelt, with hopes of linking to a future trail in Kansas.

The trail's grand opening was held April 29, during the Annual Birding and Crystal Festival at Salt Plains Refuge.

The development of the trail has been a grassroots effort of local citizens, landowners, non-profit organizations, conservation groups, government agencies, businesses and communities in western Oklahoma. The idea originated five years ago during a meeting of the High Plains Resource Conservation & Development, a non-profit organization funded by the USDA Natural Resources Conservation Service.

"We were talking about the wildlife birding trails in Texas, and we just started brainstorming about how we could do something similar in Oklahoma," explained Kenny Knowles, chairman of the Oklahoma Wildlife & Prairie Heritage Alliance (OWPHA) "It had meager beginnings, but one thing led to another and now we have the designated trails along with the map." The OWPHA works to increase landowner awareness of funding, education and assistance programs, in the arena of wildlife conservation.

Federal funds were used for the master plan – with additional funding from state grants and contributing partnerships and agencies. There were countless "in kind" contributions. Each loop was responsible for funding its own directional signage.

Treasures in Western Oklahoma

The Great Plains Trail consists of 13 driving loops that span the entire western portion of the state. Each loop guides

Mushing for Fun and Relaxation

19 Days to Complete Serum Run

By Alan Peck

My wife, Barbara, and I sat next to our lead dogs on the sea ice in front of Nome, Alaska. My face was raw and chapped from weeks of exposure to wind and cold. My muscles were a little sore and I longed for sleep. I took off my heavily lined mitts and rubbed the deep splits that had developed on my fingers, the result of cold air that had sucked my skin dry.

It had been days since my last shower and a faint bad odor was present even though I was wearing layers of clothes under my parka. Like me, Barbara was feeling worn and tired.

Right then, we turned to look at each other and our smiles developed into laughter.

Barbara, our team of 12 dogs, and I were expedition members of the Serum Run. Our three-week journey ended moments ago when the expedition dog teams and supporting snowmobiles followed the trail into Nome. Soon enough we would all be on a plane, back to that part of Alaska where cities and towns are connected by roads.

Our dogs, still hitched to the sled, rolled in the snow or barked to go; a few patiently waited. These muscled athletes had just run 800 miles and their attitude showed me they were ready to continue.

This annual dog team journey with snowmobile support travels across Alaska's frozen rivers, tundra, and sea ice from Nenana to Nome. This year, 121 mushers and 14 snowmobile partners, along with more than 140 sled dogs, traveled 19 days to complete the route.

Dog teams carry enough supplies to be independent for a day or two while each snowmobile hauls up to 700 pounds of equipment and food in a cargo sled. We travel 30 to 70 miles each day on snow packed trails or through challenging

The Great Plains Trail of Western Oklahoma includes 13 driving loops through Western Oklahoma, crossing four national wildlife refuges and offering novel attractions like this shoe pole. In the 1990s, two farm boys who went to college decided never to farm again. They nailed their work boots to a pole and over time, other people have added their work boots. Western cowboy boots were added once, but they were removed: the pole is for farming boots only. (LouAnn Speulda/USFWS)

travelers through areas with the best opportunities to view wildlife, along with designated stopping points, including both public and private sites. The trails also showcase the state's rich Indian heritage and early settlements of the West, as well as chances to explore off-the-beaten-path travel routes and discover some of the most scenic roads. The map describes guest ranches and farms along the way as well as state parks, birding routes and, of course, national wildlife refuges.

"We're hoping to increase tourism in the area," said Knowles. "Any increase will be a boon to our communities – and so many people don't realize all the treasures we have in western Oklahoma."

The trail map is a collaborative effort of the Oklahoma Wildlife & Prairie Heritage Alliance the Oklahoma Department of Wildlife Conservation, Playa Lakes Joint Venture, Oklahoma Economic Development Authority, High Plains Resource Conservation & Development, Great Plains RC&D and the Oklahoma Tourism and Recreation Department.

Blazing the Trail

Fermata, a consulting company that assists communities in developing nature tourism, helped organize the stopping points for the trail. Landowners had to nominate their own stopping point, but knowledgeable refuge staff often recommended places with good wildlife observation.

Refuge staff worked on initial planning for the trail as well as outreach and such assessment tasks as verifying the presence of particular species or habitats. They also checked out parking areas, roads, restrooms, signs, other facilities to make sure that people could see at least some of the habitat or wildlife they expected.

Refuge staff found the work an "eye-opening experience," getting an appreciation for the landowner's perspective, as well as trying to figure out what *really* would draw people into the outdoors. Some of the more involved staff included David Maple from Washita Refuge/Optima Refuge, Betsy Rosenbaum from Wichita Mountains Refuge and Jon Brock from Salt Plains Refuge.

The OWPHA and trail volunteers worked with state legislators to address liability laws so that private landowners would be able to participate without fear of litigation.

The Great Plains Trial will be promoted by the Oklahoma Travel Department on television and in print, with maps available at state visitor centers, refuges and online at http://www.wildlifedepartment.com/wildlifetrails.htm.

"It has been very positive to work with landowners in this way. Everyone came together, understanding the value of wildlife and wildlife viewing for the benefit of conservation and the communities that surround national wildlife refuges," says Keitha Dale, a member of the Salt Plains Friends. ◆

Emily Neidigh is outdoor recreation planner at Salt Plains National Wildlife Refuge

wilderness terrain. The expedition commemorates the 20 men and their dog teams who, in 1925, relayed diphtheria serum across Alaska's frozen tundra to save countless lives in Nome. Today, the Serum Run promotes a different health issue each year; this year participants discussed snowmobile injury prevention in schools and community meetings along the trail.

Vast White Landscape

After a ceremonial send off in Nenana on February 19, we were off and running. Four days later, we crossed the most remote and lightly traveled section, 125 miles on the frozen Yukon River between the villages of Tanana and Ruby. The half-mile-wide river is surrounded by a vast white landscape of boreal forest, wetlands and low hills, forming the northern

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Refuge System hydrologist Alan Peck, his wife and their team of 12 dogs participated in an annual dog team journey across Alaska's frozen rivers, tundra, and sea ice from Nenana to Nome. This year, 12l mushers and 14 snowmobile partners, along with more than 140 sled dogs, traveled 19 days to complete the route. (Alan Peck/USFWS)

FOCUS ...on Antiquities Act

The Other Lacey Act

Congressman John Lacey

By Kevin Kilcullen and Eugene Marino

Before Rachel Carson, before Theodore Roosevelt, before Pelican Island – there was John Lacey. A lawyer and Congressman from Iowa, Lacey was already concerned about the destruction of America's forests and wildlife by the late 1800s.

With an implicit understanding of the important leadership role the federal government could play in preserving the nation's resources, Lacey first won passage of the Lacey Act of 1900 which gave federal protection to game and wild birds. Six years later, the Antiquities Act added scientific, historic and prehistoric archaeological sites and collections into a growing cadre of protected resources on federal lands.

Because Lacey was so instrumental in passage of the Antiquities Act, it was also often referred to as the Lacey Act. As he signed the Act into law, President Theodore Roosevelt noted that it was *non noblus solum*, not for ourselves alone, but to protect and preserve the past for future generations.

The Antiquities Act, celebrating its 100th birthday this year, was the first national legislation protecting federally owned archaeological and historical sites. It laid the foundation for future acts of Congress, such as the National Historic Preservation Act of 1966, the Archaeological Resources Protection Act of 1979 and the Archaeological and Historical Preservation Act of 1974.

These laws significantly affect the programs and operations of the U.S. Fish and Wildlife Service, which has more than 12,300 archaeological and historical sites on national wildlife refuges and fish

"Not for ourselves alone, but to protect and preserve for future generations."

Protecting the Overland Stage – Fort Ruby 1862-1869

By LouAnn Speulda and Virginia Parks

While the preservation of significant natural landscapes has been an important outcome of the Antiquities Act of 1906, its passage was actually a direct response to growing concern about the destruction of America's archaeological sites and loss of artifacts.

Fort Ruby, a military outpost in the desert of northeastern Nevada until 1869, had only been abandoned a decade when scholars, citizens and members of Congress began a 25-year campaign to raise American consciousness about the value of antiquities, culminating in the Antiquities Act. Today, Fort Ruby, owned jointly by the Fish and Wildlife Service and the Forest Service, is an example of how this important Act continues to foster preservation of historic places.

In Summer 2005, volunteers and professional archaeologists came together to uncover new details about the Fort's history. It was the first time the Forest Service's Passport in Time (PIT) program was used on behalf of a national wildlife refuge. PIT volunteers camped in a nearby Forest Service campground and spent one week excavating 27 sites, collecting more than 4,000 artifacts.

Supervised by Forest Service and Service archaeologists, the six PIT volunteers joined volunteers from the local community and the Youth Conservation Corps from Ruby Lake National Wildlife Refuge to begin locating the officers' housing and finding evidence of daily life. Historic maps and photographs guided exploration since development has removed all surface evidence of the fort buildings.

hatcheries. Scientific research conducted on these sites has generated more than 5.3 million museum objects, owned by the Service. Most are stored or displayed in museums, or used for research by universities.

Partnerships and Research

With its roots in scientific investigations of the past, the Antiquities Act helped foster many of the Refuge System's connections with universities and other scientific research organizations. Read, for example, the article in this issue about bison research on National Elk Refuge in Wyoming.

At Mingo and Matagorda Island National Wildlife Refuges, we learn about the important role of Service partnerships with non-governmental and Refuge Friends organizations in the preservation of cultural resources. Partnerships at Mingo and Matagorda Island restored structures that have become important refuge resources.

Chesser Island in Okefenokee National Wildlife Refuge and the recent partnership between the Service and the Forest Service's Passport in Time program on Ruby Lake National Wildlife Refuge highlight the ways historical information derived from restoration work has been integrated into environmental education programs, further linking these refuges and cultural resources to the public. The designation of Palmito Ranch battlefield as a National Historic Landmark at Lower Rio Grande Valley National Wildlife Refuge secures its protection, but also affords additional protection to important habitat used by a variety of endangered species.

In Florida's Marquesas Keys on Key West National Wildlife Refuge, a Service archaeologist teamed with law enforcement officers to aid in the prosecution of potential looters of artifacts. While the Antiquities Act focuses on the scientific value of historic and cultural resources, the Service must sometimes assign a commercial value to assets in order to prosecute such crimes to the fullest extent of the law.

When the first Lacey Act and the "other Lacey Act" were brand new, Major John Lacey said that "for more than three hundred years destruction was called 'improvement' and it has only in recent years come to the attention of the people generally that the American people were like spendthrift heirs wasting their inheritance." A century later, the Service continues to bear the proud but weighty responsibility of protecting and managing that inheritance on more than 97 million acres of public land. ◆

Kevin Kilcullen is chief of the Refuge System's Branch of Visitor Services, Division of Visitor Services and Communications. Eugene Marino is the U.S. Fish and Wildlife Service archaeologist.

Historical Perspective

During the 1860s, the Overland Stage and Mail Service carried both passengers and mail across the western frontier to California. The route took stagecoaches through Ruby Valley, where attacks and robberies frequently occurred. A growing number of settlers traveling through the region also caused conflicts with Native Americans. So, military protection for travelers and property was deemed necessary. Fort Ruby was established on September 4, 1862, staffed by regular army and Nevada volunteer militia.

In the fall of 1862, a few log buildings were quickly constructed to protect the men from winter weather. Over time, officers' housing, barracks for soldiers, a hospital and Quartermaster's office were built around a parade ground.

The Treaty of Ruby Valley was signed at the fort in 1863 between the government and representatives of the Western

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Volunteers from the Forest Service Passport in Time program, the Youth Conservation Corps at Ruby Lake Refuge and the local community excavated 27 sites looking for evidence of officers' housing and daily life at Fort Ruby. (LouAnnSpeulda/USFWS)

FOCUS ...on Antiquities Act

Science in the Service of History

"Refuges are places where the people of today can renew the ties to their cultural heritage by viewing ancient and historic sites."

Fulfilling the Promise, 1999

Two federal agencies, a local historical society, the chapter of the Wyoming state archaeological society, private individuals and companies, an international conservation organization and dozens of volunteers have been digging in the dirt to understand the role of bison in the ancient ecology and economy of Jackson Hole at National Elk Refuge in Wyoming.

Large mammal bones were found in 1971 on what is known as the Goetz site on the National Elk Refuge during limited excavations by the University of Wyoming. Thirty years later, in 2001, formal investigations were funded by grants from the Earthwatch Institute and the Challenge Cost Share program of the U.S. Fish and Wildlife Service.

The refuge provided administrative and heavy equipment support. Service regional archaeologist Rhoda Lewis also assisted the project, and from 2001 to 2004, Earthwatch volunteers from 16 states and six countries enthusiastically provided more than 6,000 hours of labor.

Led by Ken Cannon and Molly Boeka Cannon of the Midwest Archaeological Center of the National Park Service, the dig included hand excavation and backhoe trenching. Geophysical surveys and three-dimensional mapping are being used to locate cultural materials and manage data.

Bones of bison and elk were found as well as signs of cooking and stone tool production. Glacier once covered the entire area, and a valley with steep walls may have served as a natural

Cane Grinding and Turpentining in the Okefenokee

As many as 2,000 students visit Okefenokee Refuge and the Chesser Homestead each year. "The refuge is a true outdoors classroom," says Refuge Ranger Jim Burkhart, "not just another field trip, but a hands-on learning experience." (USFWS)

In the late 1800s, W. T. Chesser and his family settled a small island – now appropriately called Chesser Island – on the eastern edge of the Okefenokee Swamp in southeastern Georgia. Today, the restored Chesser Homestead – including several re-created outbuildings, such as the corncrib, syrup and smoke houses – is an important historic site, used for interpretive programs at Okefenokee National Wildlife Refuge.

Tom and Iva Chesser, the last family to leave the island, raised seven children in the homestead they built and occupied until the late 1950s. About 20 years later, the U.S. Fish and Wildlife Service purchased and restored the homestead. Refuge Ranger Jim Burkhart, at Okefenokee Refuge since 1978, has been building programs to help people renew ties to their cultural heritage.

For many years, Iva Chesser was a living witness to that heritage, and later, as a volunteer interpreter, captivated visitors with her vivid descriptions of daily life on the island. Tom Chesser and several other family members were Service employees for many years.

Today, several members of the extended family regularly assist with interpretive and maintenance duties at the home site.

game trap. A spring at the base of the valley may have attracted both large mammals and humans.

Cannon says a major focus of the research has been to illustrate the value of archaeology in addressing conservation biology and public land management. He believes paleoscientists, who are trained to think in long temporal spans, can provide a long-term view of ecosystem change.

Detailed study of bison and their ecology was precluded due to their near extinction in the 1880s. Therefore much of what we know about bison is based on anecdotal records and modern studies of small, isolated populations that represent only a fraction of their original range.

"What we hope to provide in this study," explains Cannon, "is a more robust understanding of bison ecology over a period of thousands of years and under various climatic regimes, in essence to provide a baseline of pre-European conditions against which modern conditions can be assessed."

Local high school groups have visited the site, and high school and college students have been involved in the research. The work at the Goetz is still in its early exploratory stages. Excavation work is expected to resume next year. ◆

From 2001 to 2004, volunteers from 16 states and six countries enthusiastically provided more than 6,000 hours of labor at the Goetz archaeological site on National Elk Refuge in Wyoming. (Ken Cannon)

Daily Living in the Swamp

"These early settlers are as much a part of the history of the refuge as the wildlife," says Burkhart. Those who settled the island were subsistence farmers, like many other pioneer families in and around the Okefenokee. In cultivating the land, the pioneers altered much of the landscape.

The Service is now restoring the longleaf pine and wiregrass communities lost to farming but critical for such state or federal listed species as the red-cockaded woodpecker, the gopher tortoise and the indigo snake.

Burkhart is convinced that the historic homestead is one asset that attracts visitors to Okefenokee Refuge, which provides information on habitat restoration and preservation.

The annual fall Okefenokee Festival brings thousands of visitors to the nearby town of Folkston. Sponsored by the Okefenokee Chamber of Commerce and the refuge, the festival features arts and crafts, live entertainment and a parade. Afterward, 1,500-2,000 people travel to the Chesser Island Homestead, where they often spend the rest of the afternoon, seeing demonstrations of 19th century homemaking and sample period cooking, including soup, ham and biscuits, all cooked on an authentic wood stove.

By early November, locally grown sugar cane is pulverized and boiled into cane syrup as part of an interpretive program. Children push an old- fashioned cane grinder and enjoy the candy by-product. At Christmastime, 200-300 visitors participate in the refuge's "Chesser Island Christmas" program. Peak season at the refuge – March and April – finds the homestead staffed with trained volunteer interpreters seven days a week, hosting people from all 50 states and many foreign countries.

More than a Field Trip

As many as 2,000 students visit the refuge and the homestead each year. Refuge staff work with surrounding school districts to incorporate both the refuge and Chesser Island Homestead into their curricula. "The refuge is a true outdoors classroom," says Burkhart, "not just another field trip, but a hands-on learning experience."

Junior high school summer campers set up activities that mimic professional archaeological digs so they can learn about island settlers and Native American life. Upon completion, they become Junior Refuge Rangers.

"Some people believe that old structures are merely maintenance nightmares," says Burkhart. "We view them as windows on a bygone era, and a way that people can start to see how we might impact the future and our environment. They are such good tools to involve the public and to fulfill our responsibilities under the Antiquities Act." ◆

FOCUS ...on Antiquities Act

Last Battle of the Civil War Fought on a Texas Refuge

The final battle of the American Civil War – fought May 12-13, 1865 – didn't take place in such war-torn states as Virginia, Tennessee or Georgia, but in the Lone Star state of Texas. Today, 137 years after the end of the Civil War, the Lower Rio Grande Valley National Wildlife Refuge preserves the site at the Palmito Ranch Battlefield, a National Historic Landmark.

These National Historic Landmarks are places where significant historical events occurred, where prominent Americans worked or lived, or that represent those ideas that shaped the nation. The U.S. Fish and Wildlife Service owns nine National Historic Landmarks across three regions.

Alaska Maritime National Wildlife Refuge boasts three of these landmarks: Attu Battlefield and U.S. Army airfields; Japanese occupation site Kiska Island; and Yukon Island Main Site. There are two in the Pacific: Midway Atoll National Wildlife Refuge and Pearl Harbor Naval site; two in California, Gunther Island at Humboldt Bay National Wildlife Refuge and Lower Klamath Site at Lower Klamath National Wildlife Refuge; and Pelican Island National Wildlife Refuge in Florida, the nation's first national wildlife refuge.

Back in Texas in 1865, the Trans-Mississippi Department of the Confederate Army, which included Texas, had not surrendered by the time General Robert E. Lee's Confederate Army of Virginia surrendered to Ulysses S. Grant at Appomattox on April 9.

Newly restored Sweet's Cabin on Mingo National Wildlife Refuge in Missouri (Vergial Harp/USFWS)

Partnering for Posterity

The Antiquities Act grants legal protection to objects that may be hundreds or even thousands of years old but it often takes hundreds, or at least dozens, of people to do the real work of protecting. Friends groups, partner agencies, universities, local and national advocacy organizations, volunteers – all have helped refuges conserve history

One large rainstorm during the summer of 2005 caused the roof to collapse on one of the last remaining Depression-era structures in southeast Missouri. "In that moment," says Vergial Harp, refuge ranger at Mingo National Wildlife Refuge, "the future for the preservation of Sweet's Cabin on the refuge looked bleak."

Thelma Slovensky, born in 1921 on what is now refuge land, said that Roy Sweet built the cabin from cypress logs that he floated to a sawmill at Mingo. She remembers Roy and Gladys Sweet as "a happy, quiet, lovely couple" who raised hogs, cattle and goats and farmed nearby land. They hunted for rabbits, raccoons, and squirrels and in the summer, they would gather blackberries, dewberries, wild greens and honey.

The Mingo Swamp Friends offered the labor and materials to restore the Sweet cabin, working with Great Lakes Region Historian John Dobrovolny to identify appropriate materials. In November

The site of the last battle of the Civil War was acquired by the Fish and Wildlife Service as habitat for endangered species like the ocelot. In 1997, Palmito Ranch Battlefield was designated a National Historic Landmark The battlefield is now part of the Lower Rio Grande Valley National Wildlife Refuge. (USFWS)

Bittersweet Victory

On May 12, Union forces from Brazos Island advanced on Confederate troops at Fort Brown (Brownsville), resulting in a running two-day battle centered at Palmito Ranch. By the time the final shot of the Civil War rang out, the Union had been forced back to Brazos Island, defeated in its clash with the Confederates. The Civil War that began in South Carolina finally ended on the coastal plain of Texas. Ironically, it ended with a bittersweet Confederate victory.

The area was ranched until the 1990s, when it became one of the Service's top priority land acquisitions because of its significant endangered species habitat. The coastal lands that are protected by the refuge include habitats utilized by such endangered species as the ocelot, Aplomado Falcon, Piping Plover, and nesting Kemp's ridley sea turtles. Between 1988 and 1999, the Service purchased numerous tracts from 12 landowners, totaling 21,000 acres. The Service and the Texas Historical Commission jointly funded a study that led to the designation of 4,000 acres of the refuge, the core battlefield site, as a National Historical Landmark.

Following the historical designation – the highest among historical sites – National Park Service battlefield archeology specialists conducted surveys of the refuge to reconstruct and better understand the battle that took place in 1865. The area is now administered as part of the Lower Rio Grande Valley National Wildlife Refuge. ◆

David Siegel in the Albuquerque Regional Office USFWS contributed to this article.

2005, volunteers brought materials from an old barn and loads of shingles with nails that matched the ones on the sagging roof structure. It took several days to remove and replace the collapsed roof. The hard work was rewarded with fond memories and stories of what the cabin and the family had once enjoyed and endured. Now the cabin provides a quiet space for reflection for refuge visitors.

Matagorda Island Lighthouse

Across the Mississippi River in Texas, an historic lighthouse needed repair and a private foundation came to the rescue. The cast iron Matagorda Island Lighthouse was built in 1852 and currently sits on the Matagorda Island unit of the Aransas National Wildlife Refuge. The U.S. Fish and Wildlife Service, Texas Parks and Wildlife and the Texas General Land Office jointly manage the island.

The $1.2 million required to restore the lighthouse came from a state grant matched by funds raised by the private, nonprofit Matagorda Island Foundation. The Service signed a Memorandum of Agreement with Calhoun County, Tex., to work in partnership on the stabilization, restoration and management of the lighthouse, which was repainted. A replica handrail and a beacon were installed, and the Foundation provided a solar-powered light.

The newly restored lighthouse was dedicated on July 11, 2004, complete with a plaque placing it on the Department of the Interior's National Register of Historic Landmarks. The lighthouse itself is on the site of a Civil War battle, and the island has also been an Air Force bombing range, a ranch and a stopping point for pirates. Descendants of the original lighthouse keeper, Captain James E. Cummings, attended the dedication.

Refuge Manager Joe Saenz at Matagorda Island National Wildlife Refuge says the refuge manages the wildlife habitat surrounding the lighthouse for Aplomado falcons, piping plover and Kemp's Ridley sea turtles. With the help of volunteers, three sea turtle nests were documented on the island for the first time. Saenz says there is also a focus on whooping cranes which are managed through prescribed burning. Freshly burned areas are often used by foraging cranes during the winter.

Several years ago, the Texas Department of Parks and Wildlife halted a public ferry service; currently, only private boats can access to the island for camping, hunting and fishing. The refuge provides interpretive programs for special events. ◆

Vergial Harp, Refuge Ranger at Mingo National Wildlife Refuge and Joe Saetz, Refuge Manager at Matagorda Island National Wildlife Refuge.

FOCUS ...on Antiquities Act

Digging for Pirate Treasure, Illegally

Potential looters made a planking trail through a mangrove swamp in Florida to search for buried treasure. Two men who never found the tiniest nugget of gold did plead guilty to trespassing, disturbing and destroying mangrove plants. They were fined and ordered to pay for the restoration of the swamp. (Bill Wilen/USFWS)

It is the stuff of movies: digging for pirate treasure on an island where a Spanish galleon was lost. It is also the stuff of significant concern on refuges when treasure hunters damage habitat resources or archaeological sites.

Although the Antiquities Act focuses on the scientific and historical value of archaeological sites, the illegal market in antiquities is huge, second only to the illegal market in drugs and guns according to Rick Kanaski, regional historic preservation officer for the Southeast Region. As this market expands – especially with Internet selling – so does damage to refuge resources as people search for buried treasure and Native American or Civil War artifacts.

Going After the Looters

In order to prosecute looters and thieves, Service archaeologists are often required to assign a commercial value to artifacts and sites. Kanaski says he may do five such site damage assessments a year in addition to responding to a wide range of law enforcement questions about artifacts found on refuges.

Kanaski became part of an investigating

Fort Ruby – *from pg 11*

Shoshone. The treaty stipulated an end to hostile actions against emigrant trains, the Overland Stage and telegraph lines. In 1869, the railroad began transporting mail and passengers more swiftly and cheaply, rendering Fort Ruby obsolete.

Uncovering Fort Ruby's Legacy

In 2001, Ruby Lake Refuge acquired the land on which the fort had stood, sharing responsibility for the fort with the Forest Service since the property line runs right through the center of the old parade grounds. The agencies entered into a partnership to explore the archaeological record, develop a research plan and organize an excavation project.

Nearly half of the artifacts – including arrowheads – discovered during last summer's excavation were related to Native American use of the site. Fort records note that Western Shoshone camped outside the post during the winter and the soldiers provided them with blankets and food. The artifacts reveal that Native Americans had been camping at the site for about 4,500 years.

Architectural materials uncovered include machine cut nails and thin window glass, common to the 1860s. Recovered household

team in 2003, when men working for a salvage company decided to search for treasure from the Spanish galleon Santa Margarita, which had been lost in a hurricane in 1622. Legend had it that some salvaged cargo had been buried on Marquesas Keys, now part of Key West National Wildlife Refuge in Florida.

The salvage company had legitimate permits, but these men did not. The captain of the salvage vessel notified the Florida Fish and Wildlife Commission as soon as he noticed equipment and a small boat missing. Florida law enforcement authorities found the would-be thieves at the edge of a four-foot-deep hole they had dug in the mangrove swamp.

Kanaski says the men claimed to have a remote sensing device that led them to gold. They had also dragged a pump, a variety of hoses, plastic milk and bread crates for sifting sand, planking to make a trail over the swamp and cloth bags to carry away the loot.

Assessing the Damage

Kanaski was asked to determine whether an archaeological site had been damaged and to document the physical damage to the site and the cultural record. Archaeological investigations on national wildlife refuges and hatcheries require both an Archaeological Resources Protection Act (ARPA) permit and a Refuge Special Use permit. Kanaski, whose office processes ARPA permit applications, found that no permits had been issued for investigations on the Marquesas Keys. After consulting the regional site files, as well as the Florida Bureau of Archaeological Research, he found that no archaeological sites had been recorded anywhere on the Keys.

An integral part of a damage assessment is to assign monetary values for the restoration and repair of the damaged site, the commercial worth of any stolen artifacts, and the archaeological value. The latter reflects the value of the scientific information contained in the damaged portion of a site and the estimated costs to retrieve, analyze the recovered artifacts and samples, prepare a report and subsequently curate the artifacts and field records.

Kanaski concluded that while the damaged area was not an archaeological site, the presence of additional open-water pools in the mangrove stand suggested that similar unpermitted episodes of treasure digging occurred in the past. Local folklore continued to fuel dreams of finding an imaginary Spanish treasure buried on the Refuge. Kanaski recommended continued law enforcement monitoring of the Marquesas Keys to protect the mangroves and unrecorded archaeological sites.

The swamp looters never found the tiniest nugget of gold but two men pleaded guilty to trespassing, disturbing and destroying plants (mangroves), searching for buried treasure and installing structures on a national wildlife refuge – all federal crimes. Each was ordered to pay a fine and restitution of just under $15,000.

Part of the restitution money will be used to cover the cost of Kanaski's time and that of the many other local, state and federal law enforcement authorities who made the prosecution possible. ◆

items include ceramic tableware, etched glass and a soup tureen lid – all evidence of the officers' higher social standing. The unusual discovery of a porcelain doll's head suggests that families with children accompanied officers to the Fort.

Lou Ann Speulda will be working with a Forest Service archaeologist this summer to analyze the artifacts, which will be curated at the Nevada State Museum in Carson City. ◆

Lou Ann Speulda is the Service's Northwest Region/California-Nevada Office historian/historical archaeologist. Virginia Parks is an archaeologist/ outreach specialist in the Service's Northwest Region.

Volunteers excavated 4,000 artifacts from the site of Fort Ruby at Ruby Lake National Wildlife Refuge in Nevada. (LouAnn Speulda/USFWS)

Around the Refuge System

Oregon

Most thefts don't end as happily as this. In late December 2005, four canoes, six paddles and 12 personal flotation devices were stolen from a building on the Siletz Bay National Wildlife Refuge. For the past four years, the canoes provided transportation for middle school students conducting field-based research projects on the Siletz Bay Refuge and nearby Nestucca Bay Refuge. Student-designed projects explored large woody debris as fish habitat, inventoried frog populations, and investigated water quality in tidal marshes. The theft meant an end for the student science program, as well as the refuge's guided interpretive tours during spring and summer.

The canoe theft received extensive publicity in local newspapers and on the refuge's Web site. The news also prompted two local residents – former environmental educators – to donate two canoes to keep the science projects going. Then, in mid-February, a boater phoned the county sheriff to report that he had seen the stolen canoes under a bridge. Refuge staff retrieved the canoes and gear. Everything was found in great condition, except one personal flotation device. The students already have used the canoes for a woody debris study and an Oregon red-legged frog survey.

North Carolina

Riders on any of the ferries in the extensive ferry system in eastern North Carolina now can learn about national wildlife refuges in the eastern part of the state, as well the Charles Kuralt Trail and the Wings Over Water festival. The North Carolina Department of Transportation (NCDOT), which operates the Ferry Division, has partnered with the U.S. Fish and Wildlife Service to place fiberglass interpretive signs on every ferry in the system and at major terminals. Refuges in the ecosystem shared the cost of the interpretive panels, and NCDOT contributed the manpower and materials to frame and mount each panel. Alligator River National Wildlife Refuge Manager Mike Bryant commented, "North Carolina probably has the best-run ferry division anywhere in the country. These panels will provide excellent information and entertainment for ferry passengers – something to keep them busy on the long ferry rides. And, the more information we can get out to folks about national wildlife refuges, the better for us. Plus, I'm sure that taxpayers are always happy to see cooperation among state and federal agencies! It stretches those tax dollars to produce a lot more when we partner."

South Carolina

The carcass of an endangered humpback whale was discovered in January on the remote beach of Cape Island, the northernmost barrier island within Cape Romain National Wildlife Refuge. National Ocean Service's biologists believe that the 45-foot, 30-ton female was struck and killed by a ship; the whale was found to have multiple fractures to numerous ribs, with bone shards throughout its body. Because of its status as an endangered species, tissue samples are collected on all whales for reproductive, contaminant, life history, genetic and immunology studies. Some ribs and one vertebrae from this particular humpback whale were sent to the South Carolina Aquarium, a vertebrae was sent to the McClellanville Museum, and two vertebrae and one rib were sent to the Seewee Environmental Center. Bones from any whale carcass need to be registered with the National Marine Fisheries Service and many are housed at the Smithsonian. The humpback was on the brink of extinction in the early 20th century due to modern ships with harpoon guns. Today, between 7,000 and 8,000 humpback whales are found in the Atlantic and Pacific oceans.

An endangered humpback whale was discovered on the remote beach of Cape Island within Cape Romain National Wildlife Refuge. Biologists believe the whale was struck and killed by a ship. A large whale beaches every two to three years in South Carolina. (National Oceanic and Atmospheric Administration/Department of Commerce)

North Dakota

Arrowwood National Wildlife Refuge recently received the prestigious Natural Resources Award from the Greater North Dakota Chamber of Commerce. Kim Hanson, project leader at the Arrowwood Refuge Complex, says the award is primarily a tribute to refuge involvement in Birding Drives Dakota and the Potholes and Prairie Birding Festival. Refuge staff helped three local communities select sites and write text for a brochure promoting nine good

Birders flock to Arrowwood National Wildlife Refuge for the annual Potholes and Prairie Birding Festival in June, where they are encouraged to enjoy Birding Drives Dakota. The mapped routes cross three national wildlife refuges and identify outstanding stops to observe birds and waterfowl. Learn more at www.birdingdrive.com (USFWS)

driving routes to see birds and waterfowl. The Birding Drives cross Chase Lake, Arrowwood and Long Lake National Wildlife Refuges. The first Potholes and Prairie Birding Festival, held in 2003 to publicize Birding Drives Dakota, was funded with a $20,000 Challenge Cost Share grant from the Service. The annual festival has been growing ever since, with visitors from more than two dozen states last year. Publicity for this year's festival, June 7-11, encourages birders to take a weeklong birding vacation. "We want to grow the festival exponentially," says Hanson, all the while emphasizing that it is a community event in which the refuge participates. "This community is exceptional in its appreciation for natural resources and the realization that they can be good for the economy."

Of Note…

Eugene Marino, Service archaeologist, is the new chairman of the Heritage Asset Partnership, a Department of the Interior committee providing expertise on historical assets to larger Departmental Asset Management groups. The committee includes Federal Preservation Officers from all the DOI Bureaus. Currently, DOI is completing an Asset Management Plan that will provide detailed information on maintenance and disposition of all assets, including property and buildings. Marino says the partnership's role will be to enhance information pertaining to such heritage assets as archaeological sites, historic buildings, and collections – important resources protected by law and for which bureaus are accountable. Recommendations made by the partnership will be included in future versions of the DOI Asset Management Plan.

Doug Vandegraft, the Service's chief cartographer since 2000, has been elected president of the Cartography and Geographic Information Society (CaGIS) for 2006. CaGIS is a member organization of the American Congress on Surveying and Mapping and is the official American Delegation to the International Cartographic Association. CaGIS serves as the primary focal point in the United States for individuals interested in cartography and geographic information related professions.

Idaho

Call it the two "R's:" reading and refuges. The "Reading at the Refuge" program, started two years ago for preschoolers and their families, has brought a whole new audience to Deer Flat National Wildlife Refuge, one of the nation's oldest refuges. "In trying to raise our visibility, we want to reach children – and their parents – with programming that is a logical extension of families' interest in nature," said Outdoor Recreation Planner Susan Kain.

On the first and third Tuesday mornings and again on the first and third Wednesday afternoons each month, the refuge presents books with an environmental flavor. Each month, a different theme is explored – from bunnies in the spring to bats and spiders at Halloween. The 40-minute program features Kain reading two or three books, creating a crafts project and often offering the Craisins that are now available to refuges through a partnership with Ocean Spray. "Children draw families to a wildlife refuge," notes Kain.

Bowhunting Across the Ages

Archery on Bulls Island at Cape Romain National Wildlife Refuge in South Carolina is a tradition going back more than half a century. Archery at Deep Fork National Wildlife Refuge in Oklahoma is a tradition in the making. For refuges, hunting can be an important tool for wildlife management as well as a compatible recreation opportunity that helps teach young people about the link between sport and outdoor resources.

About 70 students from three schools participated on March 28 in the first archery tournament ever held at Deep Fork Refuge. The refuge partnered with the Oklahoma Department of Wildlife Conservation and others to translate the indoor skills taught through the Archery in the Schools program into an outdoor experience.

A planning committee, including the refuge, concluded in December 2005 that Okmulgee County, Okla., should become a showcase for the state's Archery in the Schools program. Other committee members represented the Oklahoma Department of Wildlife Conservation, the National Wild Turkey Federation, several local schools and sportsmen's groups, and a large local archery dealer. In Oklahoma, the Archery in the Schools curriculum is geared to those in grades 4-12 and follows national physical education standards.

The refuge's Cussetah Bottoms Recreational Area had been planted with ryegrass on a large enough area to hold 25 targets. East Central Electrical Cooperative placed poles in the ground to support the catch net behind the targets. One instructor was John Magera, an archer on the U.S. Olympic team in 2004 and Refuge Operations Specialist at Crab Orchard National Wildlife Refuge in Illinois.

Ninety third, fourth and fifth graders tried their hands at bowfishing during an archery tournament at Deep Fork National Wildlife Refuge in Oklahoma. The tournament was part of Oklahoma's Archery in the Schools program. (Elizabeth Slown/USFWS)

A 3-D shooting trail was set up in a wooded area, with foam wildlife targets borrowed from the Okmulgee County Bowhunters Council and Archery Associations. There were lessons on the history of the bow, bow making, predator-calling demonstrations, and safety. Third, fourth and fifth graders were also

Botanical Explorations in A Glacial Refugium

by Stacy Studebaker

Within the Kodiak National Wildlife Refuge lies a rugged, remote and stunningly beautiful area known as the Kodiak refugium, where the massive sheets of glacial ice that flowed across Kodiak Island from the Alaska Peninsula missed a few mountains and ridges during the most recent glacial periods. These spots may have provided habitable ground to some of the hardiest plants and animals of the Northern Hemisphere.

Funded by a U.S. Fish and Wildlife Service grant, a team of botanists explored the Kodiak refugium for a month last summer, the first time it had been studied since the 1960s. I was fortunate enough to be included as the local botanist and photographer. This summer, a new FWS grant will fund another expedition to the Mt Glottof Research Natural Area, the most mountainous part of Kodiak Refuge.

Known as glacial refugia, these areas are of great interest to scientists because they provided places for arctic and subarctic flora to become a living biological bank from which the land could draw for recolonization as it recovered from the ice age.

Coastal refugia are bordered on at least one side by ocean, where they become

A team of botanists collected about 320 species of plants, including this Arctic forget-me-not, on Kodiak Refuge. (Stacy Studebaker)

introduced to bowfishing as they shot arrows at plastic fish floating in a wading pool and reeled the arrow back using a closed reel attached to the bow.

One little girl, Casey Martel from Beggs School, has one arm that could not physically hold the bowstring. Her teacher, Jeff Souders, adapted the bow by attaching a little piece of leather on the string near the nocking point. Casey pulls the leather with her teeth to let go the arrows and shoots as well as her classmates. "She kept asking me all week if she would get to come today," said Souders. "I'm so proud of her. I'm proud of all of them."

For Several Generations

On the other side of the country, the Bulls Island archery hunt at Cape Romain National Wildlife Refuge in South Carolina has been drawing young and old for several generations. Sumpter Cassels Sr. first attended the refuge hunt in 1957, three years after its inaugural. In the following years, he brought his family and Scout troops to the island for a week of hunting and exploration. They came with heavy canvas tents and Coleman stoves, recurved and long bows.

Cassels' son recalls his first trip when his father brought him to the island. It was 1961 and he was 11 years old. "I was basically the firewood boy, oyster boy. The old men used to run me ragged." That was just fine for young Cassels as he thoroughly enjoyed the camping adventures.

The younger Cassels harvested his first deer in 1988. Cassels, using one of the first compound bows (40.5 pound magnum), was taking practice shots at a small tree when two deer appeared. He released an arrow and, not realizing he had hit one, shot his remaining arrows. He later found the doe. It has been the only deer that Cassels has taken off the island.

Today, Cassels and other family members hunt only with compound bows. The campsite has "evolved" as the family acquired the best of camping gear and equipment. Gas ovens and stoves are used to cook tasty sirloin tip roasts, brisket and apple crisp.

Cassels noted that, in earlier years, anywhere from 75 to 170 people from all over the country would participate. At one hunt during the 1970s, almost 300 hunters came to the island.

According to Cassels, boats have sunk and a lot of equipment has been lost between the mainland and island. The accidents have not discouraged Cassels and other archers from coming back year after year.

"It's just a kind of family thing where people get over here and they just like it so much. Generation by generation is how we keep something like this going. That and thanks to the federal government for wanting to keep it going. We're losing places to hunt faster than we're gaining them." ◆

Patricia Lynch, park ranger at Sewee Visitor & Environmental Education Center, Cape Romain Refuge, S.C., and Elizabeth Slown, Southwest Region Public Affairs, contributed to the article.

refrigerated, self-contained ecosystems, locked up for an ice age without much "communication" with the rest of the world. Many botanists regard the survival of plants in refugia as the best explanation for the distribution of certain hardy alpine plants in northern mountainous regions today.

Leslie Kerr, Kodiak Refuge manager, sees the expeditions as a way to get better baseline information on the plant life of the refugium. With an area of about 400,000 acres, the Kodiak refugium comprises about 17 percent of Kodiak Island and is one of the largest and most remote coastal refugia known in the Northern Hemisphere.

Bill Pyle, supervisory wildlife biologist at Kodiak Refuge, organized the 2005 team. The team also included botanist Carolyn Parker from the University of Alaska; bryologist Eve Laeger from the California Academy of Sciences; and Page Spencer, an ecologist with the National Park Service

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Botany team members Carolyn Parker, Stacy Studebaker, Eve Laeger and Page Spencer collected hundreds of plants on the Kodiak refugium last summer. (Stacy Studebaker)

Salmon Camping in Alaska

By Tina Shaw

Each summer, after the whales have made their annual return to south central Alaska, another annual migration takes place along the coast of Kodiak. June signals a return to the Kodiak Summer Science and Salmon Camp – Kodiak National Wildlife Refuge's experiential summer learning program.

Salmon Camp is in its 11th year of educating Kodiak's youth about their natural world and the human dimension of how people relate to, and are shaped by, their own backyard. From its inception, Salmon Camp has tried to provide a path for local students to channel their love of Kodiak's wild places and wild creatures into a deeper understanding and reverence that might lead to future careers in conservation.

Students from preschool through sixth grade attend six week-long day camps and multiple shorter sessions in remote villages. The camp seeks to educate young people about the natural and cultural systems that define Kodiak's geography, and empower them to investigate their own connections to this special place through hands-on learning, self-reflection and group discovery.

About 150 campers from the City of Kodiak and surrounding villages attend each summer, representing a wide socioeconomic and ethnic mix, including Native Alut, Anglo, Filipino and Hispanic youngsters. The remote campsites in the villages best illustrate the two-way learning and student-led nature of Salmon Camp and are a true adventure for visiting instructors, many of whom have never flown in a float plane.

The remote village camping sessions are free. Campers pay $100 for a full week of the main site Salmon Camp and scholarships are available. Campers typically return summer after summer, often coming back as junior counselors or interns as they get older.

Salmon Camp receives in-kind donations from local businesses and funding from Alaska Natural History Association, with matching funds from the U.S. Fish and Wildlife Service Challenge Cost Share program.

Pre-schoolers and kindergarteners learn about weather patterns of coastal Alaska and their global connections. Those in grades 1-3 focus on geology, learning about the use of rock cairns in Alutiiq culture as a means of communicating and way-finding on Kodiak Archipelago. Fourth through sixth graders explore how land is created and eroded by water, with an introduction to the concepts of hydrology, watersheds and deposition.

As nine-year-old Eddie Lee explained it, "We learned the life stages of a salmon, about bald eagles, bears and bacteria in the wetlands. When you're down at the Buskin and smell rotten eggs - that's bacteria."

As time allows, students are also introduced to fishery economics and tidepool ecology. They may also visit local cultural and maritime museums.

Instructors are volunteer environmental education interns who receive a small stipend and live at the refuge bunkhouse. Recruited through the Student Conservation Association, many are

Playa Caracas, Playa La Chiva and Punta Arenas - three beaches at Vieques Nationa Wildlife Refuge — are now ports of call for birders, divers, researchers or anyone trying to get away from the island's hustle and bustle. (Clare Mowbry/USFWS)

Phosphorescent Bay: Floating through Stardust

Vieques National Wildlife Refuge, eight miles off the east coast of Puerto Rico, is home to what may be the most spectacular of the world's few surviving bioluminescent bays, Puerto Mosquito.

For 60 years, since the beginning of World War II, the U.S. Navy had been the largest landowner on Vieques, controlling two-thirds of the 21-mile-long island. Indeed, the eastern end of the island was a bombing range, largely off-limits to the public. In May 2003, the Navy relinquished more than 14,500 acres to the Department of the Interior. Two years earlier when the 18,000-acre national

Kodiak Summer Science and Salmon Camp at Kodiak National Wildlife Refuge in Alaska is in its 11th year and provides a way for local students to channel their love of wild places and wild creatures into a deeper understanding that might lead to careers in conservation. (USFWS)

completing degrees in the natural sciences or education, and their internship fulfills the practicum requirement. Interns come from all over the country.

New for 2006

This summer, a new science curriculum will be launched, piloting learning kits from Carolina Biological Supply Company. Traditional Salmon Camp activities will be built around the The Science and Technology for Children® (STC®) learning kits.

These learning tools were developed to function as a complete science program in a traditional classroom. Because Salmon Camp is only a week long, a three-year pilot will rotate a cumulative bundle of investigations one summer after another. While activities have always varied from year to year, Salmon Camp lacked a cumulative progression. This discovery-based curriculum is the perfect match for Salmon Camp's adventurous "get your feet wet" fun.

Salmon Camp is also partnering with the Kodiak Arts Council, a local non-profit organization, to co-teach the first art-intensive Salmon Camp. Campers in fourth through sixth grades will be able to learn about the art of science and the science of art.

Within the Land and Water Module focus, for example, students will create their own educational materials about life on Kodiak. They can choose to create coloring books with scientific facts, a logo design for Salmon Camp 2007, or even a digital movie. ◆

Tina Shaw is visitor center manager at Kodiak National Wildlife Refuge.

wildlife refuge was established, the Navy had transferred acreage from the island's western end to the Department.

The military presence on Vieques – the site of many acts of civil disobedience as residents fought to end Naval operations – helped buffer the island from the waves of tourism and commercial development that have battered the beauty and fragile ecosystems of many tropical islands. Today, Vieques Refuge is the largest national wildlife refuge in the Caribbean and a destination for eco-tourists. Nearly 33,000 visitors arrived on the island in 2004, an increase of almost 170 percent as compared to 2003.

With only two small towns, Esperanza and Isabel Segunda, Vieques Refuge boasts mangrove lagoons and secluded white beaches that are not hidden behind a barrier of high-rise buildings. Vieques Refuge's three beaches – Playa Caracas, Playa La Chiva and Punta Arenas – are the ultimate ports of call for birders, divers, researchers or anyone trying to get away from the island's hustle and bustle.

"Vieques Refuge is absolutely the last ecological, historical and archaeological treasure in the Commonwealth of Puerto Rico and the Eastern Caribbean," says Oscar Diaz, manager of the Vieques Refuge. "A kind of living fossil!" He says it proudly.

Vieques Refuge is the primary nesting site in Puerto Rico for the green sea turtle, one of the three species that nest on the island. It's the largest breeding site in Puerto Rico for the endangered brown pelican. But the refuge's most extraordinary ecological claim to fame is arguably Puerto Mosquito, also called Phosphorescent Bay.

"It's a jewel," says Diaz.

Whirling Fire

People who have swum at Puerto Mosquito describe it as "floating through stardust" or "producing a trail of liquid fire with a simple scissor kick." Puerto Mosquito is not the only bioluminescent bay in the world, but it may be the most magnificent.

The reason is that the warm, shallow water of this small bay ringed by mangroves is alive with dinoflagellates, single-celled half-plant, half-animal

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Tracking Caribou for Credit

You can only hold a caribou in the water if its feet can't touch the bottom. If it's a big bull, it also helps if the caribou is gently cushioned between two boats. One person holds the caribou by its antlers, another grips the animal's tail and a third attaches a radio or satellite collar.

That's some of what high school students from Selawik, Alaska, have learned as they work shoulder-to-shoulder with Alaska Department of Fish and Game and US Fish and Wildlife Service biologists to attach collars on caribou. The collars yield valuable data on the Western Arctic Caribou Herd's yearly movements and their dependence on certain areas for calving, insect relief and winter forage.

For more than 20 years, the state Fish and Game department, the lead agency for managing the herd, has collared several dozen caribou every fall as they cross the Kobuk River north of Selawik National Wildlife Refuge. Of a herd that is nearly half-a-million strong, about 135 caribou have collars, mostly radio collars that can only be tracked by planes picking up the radio signals.

For the small groups of students who have accompanied the biologists, it's an amazing camping trip. Just getting to the campsite requires a chartered plane, ATVs and boats. Everyone stands along the riverbank, waiting for the caribou to cross, jumping to action as soon as the animals reach deep water in mid-river.

"Kids can hold small caribou by themselves," said Susan Georgette, student chaperone and outreach specialist for Selawik Refuge, "but they are amazed at how strong the animals are, especially the big bulls."

Closer Scrutiny

Six students from Selawik participated in the project in September 2005, helping to collar about 20 animals. Living in a community that relies heavily on caribou for food, the students also butchered a caribou and examined the animal's anatomy under the direction of biologists. It was a culturally relevant project that also introduced these students to the careers of biologists.

Now, Georgette, the students and their teachers are taking the project one step further by tracking caribou movements over time with data from the eight animals collared. The Fish and Wildlife Service Challenge Cost Share Program has funded the tracking project for the coming year. Approval has been obtained from the Western Arctic Caribou Herd Working Group, an advisory body of village subsistence hunters, sport hunters, hunting guides, outfitters, reindeer herders, and conservationists who work closely with state and federal resource agencies.

Under this expanded program, refuge biologists downloaded onto an Excel spreadsheet the latitude/longitude locations of the caribou since September

Blackwater Refuge – *from pg 4*

for future development decisions.

The meeting resulted in the mayor and County Council asking The Scientific-Technical Advisory Committee (STAC) of the Chesapeake Bay Program to oversee a baseline study of water quantity and quality in the Little Blackwater River watershed. The Bay Program is a coalition of state and federal agencies working to clean up the Chesapeake Bay and maintain the health of its 64,000 square mile drainage basin.

Carowan hopes the baseline study will be completed within six months. "We need it before the first house is built," he says.

The baseline study could be used for comparison to future, annual monitoring of any environmental changes as the development is built. That could give local permitting agencies scientific proof of the resort's impact on wetlands habitat. If there is a detrimental impact, Carowan notes, that same scientific evidence can be used to require mitigation along the way – better handling of polluted runoff or sewage, for example.

Could construction get ahead of the research? "If we drag our feet, it could happen," says Carowan. ◆

A planned resort development is of concern to staff who manage wetlands habitat at Blackwater National Wildlife Refuge on Chesapeake Bay in Maryland. A baseline study of water quantity and quality could help judge the environmental impact of the development. (John and Karen Hollingsworth/USFWS)

Biologists hold a bull caribou secure between two boats, while a Selawik student finishes attaching a radio collar to the animal. Selawik students helped biologists attach collars to about 20 caribou in September 2005. (Susan Georgette/USFWS)

and worked with the students to interpret these data. Over the coming months, additional location data will be e-mailed to the Selawik school. High school science and math teachers will then help students plot the data, improving map reading and computer skills as well as improving students' understanding of migration and caribou ecology.

The Selawik students hope to mount a wall-sized map in the school where push pins will mark how far the caribou travel – often 300 miles or more from their summer range to winter range. People in Selawik generally see the Western Arctic herd pass by twice a year, but may have little idea where the animals go the rest of the time.

The refuge is also providing financial support to adapt a Project Caribou curriculum from Canada. Other educational activities using the tracking data and caribou in general will be conducted in the classroom as well. ◆

Mushing – *from pg 9*

boundary of the 2.1-million-acre Nowitna National Wildlife Refuge.

It took three days to complete this trail section. Half way across, we encountered the first of many snowstorms. Heavy snowfall buried a trail marked by previous travelers. White out conditions and winds gusting to 40 mph made traveling hazardous. The snowmobiles set out to establish a new trail, but the severe conditions made it slow and difficult for them to avoid the traps hidden beneath the snow. People used shovels, tow ropes and wenches to extract snowmobiles and heavy cargo sleds as darkness complicated the situation. These are conditions where dog teams travel at a faster speed than the snowmobiles.

A day after the storm, our expedition arrived in Galena, a bush community of about 600 people on the Yukon River. I visited the U.S. Fish and Wildlife Service office that manages the Nowitna, Koyukuk and the northern part of Innoko national wildlife refuges. I talked with Karin Lehmkuhl, who, for the past two years, has helped coordinate local logistics for the Serum Run.

Standing on the runners of a dog sled as the miles go by gave me time to observe and contemplate. Traveling through Alaska's immensity, I reconnect with the fundamentals of why I work for the Service: to protect and preserve the natural habitats that are biologically unique and culturally rich – and to rejuvenate my soul. ◆

Alan Peck is a hydrologist with the Refuge System's Water Resources Branch in Anchorage. He began mushing in 1986. Since then, he and his wife, Barbara Trost, have raised their own dogs for long distance ski-jors (harnessed dogs connected to a skier with a pulk) and mushing trips. Alan was on the Serum Run in 2005 and 2006.

Barbara Trost mushed across Alaska with a team of dogs and her husband Alan Peck, a hydrologist with the Refuge System's Water Resources Branch in Anchorage. (Alan Peck)

Bird Flu – *from pg 1*

America, with its first appearance likely in Alaska.

Sampling of about 27 species of migratory birds is being conducted at more than 50 sites across Alaska, including Izembek National Wildlife Refuge. Migratory birds are also being sampled by staff assigned to the M/V Tiglax research vessel, which operates out of Alaska Maritime National Wildlife Refuge. Since 1998, more than 12,000 wild bird samples from Alaska have been examined for HPAI H5N1, including 1,100 sampled since Summer 2005. HPAI H5N1 has been found in any sample.

Species of birds have been prioritized for surveillance based on several criteria linked to potential risk of HPAI: size of the population that winters in or migrates through Alaska; proximity to known sources of HPAI H5N1 in Asia; and the ability to obtain a sufficient sample number for sensitive detection.

"This is not a hit or miss effort," said Karen Sullivan, with the Service's Alaska External Affairs Office. "The surveillance plan was designed in such a way that if the HPAI H5N1 virus is present in Alaska, and we are able to obtain all the samples we plan for, we will have approximately a 95 percent chance of finding HPAI H5N1 if it is present in even as little as 1.5 percent of the sample population."

The migratory bird species at the top of the list for surveillance include Steller's eider, Pacific golden plover, northern pintail bar-tailed godwit, Emperor goose, Dunlin, and black brant.

Interagency Plan for Early Detection

Many federal, state and local agencies as well as non-government entities in Alaska are working on this complex issue. Roles and responsibilities fall into several broad but interconnected areas primarily: wild birds, domestic poultry, and public health.

The Alaska surveillance program, developed by the Service, USGS and the Alaska Department of Game and Fish, is based on national surveillance strategy:

- Investigate disease outbreaks in wild birds – If HPAI H5N1 virus is detected in wild birds, federal officials will monitor domestic poultry and swine operations, and minimize contact between wild birds and domestic animals.
- Expanded monitoring of live wild birds – This year, 75,000 to 100,000 samples from live and dead wild birds will be collected all over the United States, including some on refuges associated with banding operations and research projects.
- Monitoring of hunter-killed birds – The Refuge System will work with state natural resource agencies to operate hunter check stations. In addition to working with USGS and USDA, the Service is also working with the four Migratory Bird Flyway Councils to enhance sampling plans for birds taken by hunters. In Alaska, hunter-killed birds will be sampled during subsistence harvest this spring and during the general hunting season in the fall.

Explorations – *from pg 21*

We'd hike a different route to a new location each day to collect from a wide range of refugium habitats. We covered four to 12 miles a day, collecting plants from sea level to 2,700 feet in elevation.

The refugium is virtually treeless, with only scattered stands of Kenai birch and cottonwood. Expansive tundra landscapes and grassy wetlands are typical of the lowlands and seem to swallow up the huge brown bears we watched at a safe distance. Clumps of alders and willows grow on the lower mountain slopes and adorn the edges of riparian habitats. Ponds with a good variety of aquatic plants were explored with a small, inflatable raft.

We followed bear and deer tracks when possible, but mostly intuitively meandered. Botanists have to focus on the ground as they hunt for plants so someone with a 12-gauge shotgun and a watchful eye on the surrounding landscape accompanied us. At base camp each evening, we'd sort, clean and identify each specimen, place them into plant presses and record habitat information.

Ten New Records for Archipelago

We collected more than 600 specimens and about 320 species of plants, three of which are listed as rare for Alaska and at least 12 that are new records for the Kodiak Archipelago. That doesn't mean they are actually "new". They could have been here for thousands of years. It is nearly impossible to determine which plants are survivors of the ice age and which are the newcomers. However they had not been formally identified.

One set of plants is housed at the University of Alaska Museum of the North herbarium and the duplicate set remains at the Kodiak Refuge herbarium.

Botanists are still in an exploratory stage in describing the flora of Alaska. Our collections and inventory made an incremental step in the overall understanding of our flora by extending the ranges of several species. We're breaking new ground. ◆

Stacy Studebaker is a naturalist on Kodiak Island.

The glacial refugium at Kodiak National Wildlife Refuge in Alaska is of great interest to scientists because it provided arctic and subarctic flora a chance to flourish and become a living biological bank from which the land could draw for recolonization as it recovered from the ice age. (Stacy Studebaker)

The National Interagency Plan also calls for using poultry flocks raised in backyards for noncommercial purposes and duck flocks placed in wetland environments as sentinels for early detection of the virus. Additionally, in 50,000 samples of water or feces will be collected from high-risk waterfowl habitats.

All of the monitoring data will be placed in a national database, which will be available to all agencies, organizations and policymakers as well as scientists who are trying to better understand and track the spread of such viruses.

Protecting People

In addition to assisting with wild bird sampling, the Refuge System is prepared to protect visitors and employees. The Interior Department has a departmental pandemic influenza plan to assure continuity of operations.

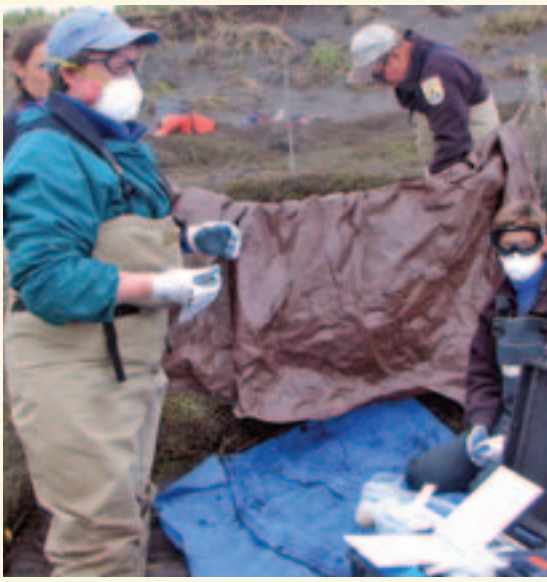
The USGS National Wildlife Health Center in Madison, Wisc., has issued guidelines for hunters and Service personnel or volunteers when handling wild birds. Those hunting in Alaska also receive a fact sheet, developed by the Alaska Department of Game and Fish.

The precautions for Service personnel or volunteers begin with basic good hygiene:

- Work in well ventilated areas indoors, or upwind when outdoors.
- Wear rubber or disposable latex gloves while handling birds.
- Use protective eyewear or a face shield when possible while handling birds.
- Disinfect work surfaces and instruments between locations.
- Do not eat, drink or smoke while handling birds.

When handling dead birds, wear coveralls, boots, particulate mask, eye protection and gloves that can be disinfected or discarded. Containment of infectious material is essential. ◆

Resources:
www.pandemicflu.gov
http://alaska.fws.gov/media/avian_influenza/index.htm



Sampling of about 27 species of migratory birds is being conducted at more than 50 sites across Alaska, including Izembek National Wildlife Refuge. (USFWS)

Vieques – *from pg 23*

organisms. Measurements have shown up to 720,000 dinoflagellates per gallon of water from the bay.

The most prevalent of the microscopic organisms at Puerto Mosquito is *Pyrodinium bahamense*, from the Greek words for "whirling" and "fire." The dinoflagellates are classified as neither plant nor animal, but as Protista. Like plants, they contain chlorophyll and are able to use sunlight for energy to produce food, the process called photosynthesis. But like animals, they can move, using whip-like flagella to propel themselves through the water.

The *Pyrodinium* only emits light when it's disturbed – by the action of an oar or a swimmer's leg, for example. That suggests to scientists that the organism's bioluminescence is a defense mechanism. But to the humans who've seen it, it's an eerily beautiful blue-ish light that glimmers more brightly at Puerto Mosquito than at any other site in the Caribbean, and perhaps in the world.

A Delicate Balance

The Big Island of Puerto Rico once boasted its own bio-bay, says Refuge Manager Diaz.

But that bay has now lost 88 percent of its glowing dinoflagellates because of development and the resulting contamination. Refuge staff is working with the Commonwealth of Puerto Rico to see the same fate does not dim the luminescence at Puerto Mosquito.

Mangroves on the refuge's coastline are crucial to its survival, says Diaz. Every bioluminescent bay in the world is bordered by stands of mangroves. As mangrove roots and leaves decay, the resulting scavenger bacteria help synthesize vitamin B-12, a crucial nutrient for the *Pyrodinium*.

Just as the life of the bioluminescent bay depends upon a delicate balance of mangrove habitat, warm shallow water and abundant sunlight, Oscar Diaz, his staff and the Puerto Rican community in which they live are working to strike a delicate balance as well: to offer the beauties of this pristine refuge to the world (and provide a new economic engine for the people of Vieques) without allowing eco-tourism to jeopardize the very resources that have — so far — survived the tourist boom in the rest of the Caribbean.

Says Diaz, "We're getting there." ◆

Director – *from pg 2*

condors are in existence because Hopper Mountain Refuge in California has worked with partners in the Condor Recovery Program. And the Refuge Friends organizations have done everything from habitat cleanup and restoration to invasive species mapping that gives our endangered species a better chance at recovery.

Leopold once asked, "How shall we conserve wildlife without evicting ourselves?" That question accurately describes the Service's challenge in implementing the ESA. We will meet it by working with folks like Kerry Russell and seeking voluntary solutions for conservation of at-risk species. ◆

Chief's Corner – *from pg 2*

opportunities are legion. Our interest and ability to work cooperatively with all other Service programs is our strength.

In that cooperative spirit, the Refuge System has helped bring back the once-endangered bald eagle. Today, an estimated 7,066 breeding pairs are thriving, up from just 471 nesting pairs in 1963. That is in no small way thanks to the 150-plus national wildlife refuges that provide homes, and how well the Refuge System joins forces with other Service programs.

Our cooperative efforts are countless, but I will add just one more. In the Southwest, Refuge Law Enforcement recently worked cooperatively with a Service Law Enforcement Agent at San Andreas Refuge in New Mexico. Together, they apprehended an individual who was illegally taking and transporting protected wildlife species. The case demonstrates the great working relationship the Refuge System has with partners, inside and outside the Service.

While I am excited about the Refuge System's future, I also recognize we are working in a very serious budget climate. We must be adaptable. We will need to change, not just to survive, but to come out of these difficult times smarter and stronger. I look forward to working with all of you, and to strengthen the Refuge System's role in meeting our "One Service" goal.

Not only do I hope to visit – and revisit – many wildlife refuges, but I also hope to meet many old friends as well as make new ones.

I want to acknowledge the work of Deputy Refuge Chief Jim Kurth in showing me the ropes during my inaugural weeks. His knowledge and experience are amazing.

I also want to hail the work of Bill Hartwig as he retires as Chief of the Refuge System. One of my best friends as well as a longtime mentor, Bill has been a great leader and he will be missed. I thank him for the 32 years he devoted to public service. Bill has left his mark on the nation's landscape, and I pledge that we, together, will accomplish yet more. ◆

Send Us Your Comments

Letters to the Editor or suggestions about *Refuge Update* can be e-mailed to RefugeUpdate@fws.gov or mailed to *Refuge Update*, USFWS-NWRS, 4401 North Fairfax Dr., Room 634C, Arlington, VA 22203-1610.

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